Chapter 6
DEMAND ESTIMATES AND PROJECTIONS

Demand assessments for 1995 and projections for 2020 were made for two major categories of water use, urban and agricultural. Urban type use is further divided into five categories as indicated in **Table 15**. All categories of urban use are self-supplied with the exception of public water supply (PWS). Although electric power generation facilities can withdraw large amounts of water, virtually all of this water is returned to the hydrologic system near the point of withdrawal. Agricultural water use is water used for crop irrigation and cattle watering and in facilities supporting these activities.,

Table 15. Water Use Categories.

Water Use Categories	Description
Urban	
Public Water Supply	Potable water supplied by regional water treatment facilities with pumpages greater than 100,000 GPD[a] to all types of customers
Domestic Self-Supplied	Households with private wells as primary source of water and water treatment facilities with pumpages less than 100,000 GPD
Commercial and Industrial Self-Supplied	Operations with pumpages greater than 100,000 GPD
Recreation Self-Supplied	Landscape (water used for parks, cemeteries, and other irrigation applications greater than 100,000 GPD, and golf course irrigation
Thermoelectric Self-Supplied	Power generation and cooling
Agricultural	Water used for crop irrigation, cattle watering and the preparation of products for market

a. gallons per day.

For 1995, the total estimated water demand for the Kissimmee Basin (KB) Planning Area was 148,270 million gallons for the year. The distribution of this demand among water use categories is shown in **Figure 9**. The category of thermoelectric self-supplied is not represented in **Figure 9** as power plants within this basin are believed to utilize reclaimed water as as the primary source.

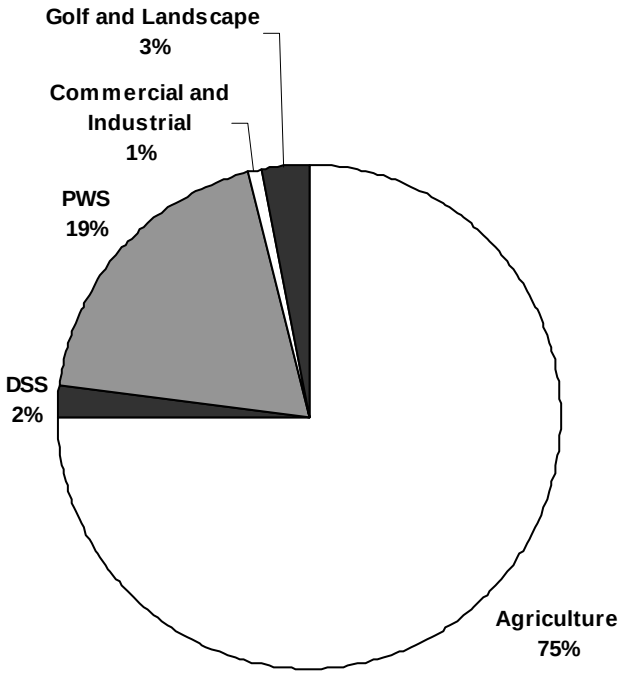

Figure 9. Total Water Demands for 1995 in the Kissimmee Basin Planning Area.

From 1995 to 2020, the total water demand for the KB Planning Area is projected to increase by 63 percent from 148,270 to 242,148 million gallons per year (MGY), as shown in **Table 16** and **Figure 10**. PWS has the largest projected increase (103 percent), from 26,040 MGY in 1995 to 53,035 MGY in 2020. However, agriculture is projected to remain the single largest category of use. In 1995, agriculture accounted for 75 percent of the total demand at an estimated 112,668 MGY. Agricultural demands are projected to increase by 54 percent by 2020 to 173,995 MGY, accounting for 72 percent of the total demand for that year.

A critical component of the water supply planning process is the determination of the 1995 and projected 2020 water use patterns. This effort required the estimation of the total water use and a determination of the distribution of that use. The following sections describe how the 1995 and 2020 water use estimates and projections were determined and how the water use was distributed. Appendix F provides detailed information on the methodology used for determining urban and agricultural demands.

URBAN DEMAND

Public Water Supply and Domestic Self-Supplied

Urban water demands were 35,602 MGY in 1995 and are projected to increase by 76 percent to 68,163 MGY in 2020. PWS was the largest component of urban water

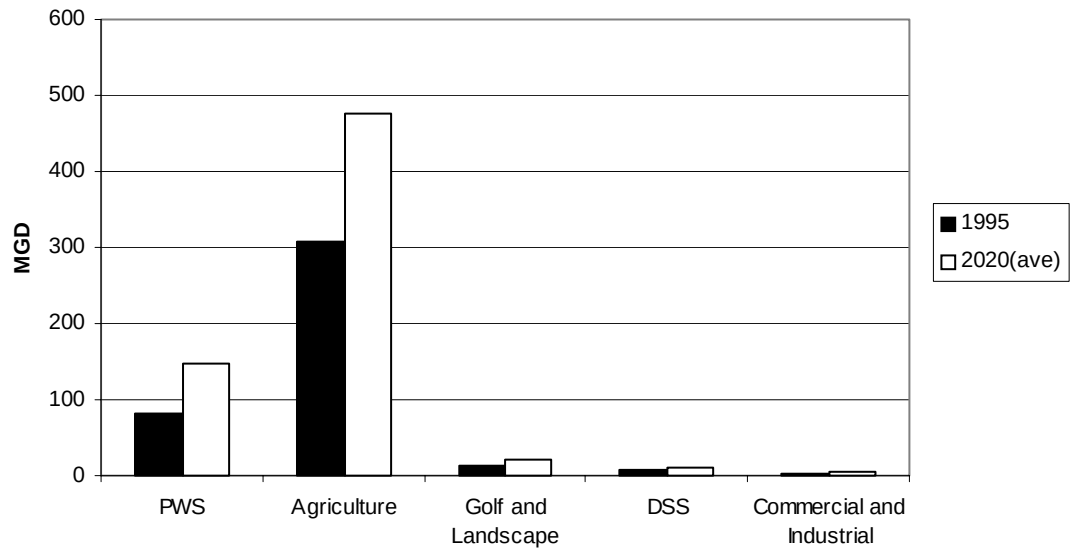

Figure 10. Comparison of 1995 and 2020 Water Demands (MGD).

Table 16. Overall Water Demands for 1995 and 2020 (MGY)[a].

Category (1-in-10)	Demand 1995	% Total	Demand 2020 (ave.)	% Total	% Change 1995-2020	Demand 2020 (1-in-10)
Agriculture	112,668	75	173,995	72	54	202,590
Public Water Supply	26,040	19	53,035	22	103	56,210
Domestic Self-Supplied	3,014	2	4,307	2	42	4,526
Commercial & Industrial	1,299	1	2,117	1	63	2,117
Recreational Self-Supplied	5,249	3	8,694	3	66	9,998
Totals	148,270	100	242,148	100	63	279,441

a. Some totals may not equal column sum due to rounding.

demand in 1995, followed by recreation self-supplied, domestic self-supplied, commercial and industrial self-supplied.

All permitted public water supply systems are required to report their use of water to both the FDEP office and the SFWMD as conditions of their respective permits. This information is typically submitted for each water treatment plant and is often submitted for individual wells. This information is available for facilities pumping greater than 0.1 MGD. The locations of these pumping facilities are identified as part of the District's consumptive use permitting process. This distribution information provides the basis on which existing and future water use is distributed.

Domestic self-supplied (DSS) water use is defined as those public supply users withdrawing less than 0.1 MGD. These users are not served by the larger utilities, but may reside within a utility service area boundary. The Districtwide Water Supply Assessment (1998) estimates that total DSS water use for 1995 was about 8.26 MGD. Water use projections for the year 2020 are 11.8 MGD.

The major driving force behind urban demand is population. Population estimates for 1995 were taken from the U.S. Bureau of the Census. The year 2020 population projections were determined from Bureau of Economic and Business Research using the medium range county estimates (**Table 17**), The total population of the KB Planning Area for 1995 was 362,837 and is projected to increase 89 percent to 686,696 in 2020.

Table 17. Estimated Population in the Kissimmee Basin Planning Area 1995-2020.

Region	1995			2020		
	Total	PWS	DSS	Total	PWS	DSS
Orange Area	186,131	171,729	14,402	349,453	335,051	14,402
Osceola Area	130,605	99,528	31,077	260,937	202,432	58,505
Polk Area	6,375	5,212	1,163	13,832	12,238	1,594
Highlands Area	7,700	0	7,700	11,590	0	11,590
Okeechobee Area	28,737	21,200	7,537	45,244	33,258	11,986
Glades Area	3,289	0	3,289	5,640	0	5,640
Total Kissimmee Basin	362,837	297,669	65,168	686,696	582,979	103,717

Source: SFWMD Districtwide Water Supply Assessment, 1998.

Urban demand is projected for the portions of counties that fall within the SFWMD. These demands are concentrated in Orange and Osceola areas, with these two counties accounting for approximately 87 percent of the KB Planning Area's urban population.

The estimated water demand for PWS and residential self-supplied users was 29,054 million gallons per year (MGY) in 1995. Per captia use rates determined from the individual utilities along with 2020 population projections were used to estimated the 2020 water supply demands. The initially projected 2020 demands were then given to the respective utilities and local government agencies for comment on the estimates and distribution of withdrawals. Some adjustments to the demands were made based upon this additional input from the utilities. The total water demand is projected to increase 105 percent from 1995 to 2020 to a total water demand of about 57,342 MGY. About 11 percent of the 1995 population were self-supplied and this is projected to decline slightly to about 8 percent in 2020 (**Table 18**). More specific information on utility service area populations and water demands, as well as the methodology used to develop these values is provided in Appendix F.

Table 18. Public Water Supply and Domestic Self-Supplied Demand (MGY).

Region	1995 PWS	1995 DSS	2020[a] PWS	2020[a] DSS	Total Percent Change 1995-2020
Orange Area	18,179	650	37,017	654	96
Osceola Area	6,872	1,597	14,227	2,520	97
Polk Area	288	66	675	88	117
Highlands Area	0	296	0	460	58
Okeechobee Area	701	252	1,116	397	59
Glades Area	0	153	0	188	22
Total Kissimmee Basin	26,040	3,014	53,035	4,307	97

a. 2020 (1-in-10) drought use estimates.

Commercial and Industrial Self-Supplied

Commercial and industrial demands supplied by public utilities are included in the PWS demands. Orange, Osceola, and Polk counties are the only counties reporting commercial and industrial self-supplied demands (**Table 19**) operating outside the PWS utilities. **Table 19** shows the estimated commercial/industrial demands within each county area. The projection methodology for commercial and industrial self-supplied demand is discussed in Appendix F.

Table 19. Commercial and Industrial Self-Supplied Demand (MGY).

Region	1995	2020	% Change
Orange Area	799	1,263	58
Osceola Area	266	533	100
Polk Area	234	321	37
Highlands Area	0	0	0
Okeechobee Area	0	0	0
Glades Area	0	0	0
Total Kissimmee Basin	1,299	2,117	63

Source: SFWMD Districtwide Water Supply Assessment, 1998.

Recreation Self-Supplied

Recreational demands supplied by PWS utilities are included in the PWS demands. Recreational demands include self-supplied withdrawals for landscape and golf course irrigation. Demand projections for this section include irrigated acreage permitted for landscaping and recreation, including golf course irrigation not supplied through a PWS system.

Golf course irrigation makes up the majority of this use category. In 1995, there were a total of 35 golf courses located within in the KB Planning Area. Of these courses, 24 use ground or surface water while the remaining 11 courses use reclaimed water as their primary irrigation source. Highlands, Okeechobee and Glades counties are expected to have no additional golf course irrigation by year 2020. Osceola County is expected to have the greatest increase in the number of golf courses. An estimated 14 new courses will be built over the planning horizon, 6 of which are projected to use reclaimed water. Future golf courses were estimated to average 150 acres in size and were distributed in those areas of largest proposed growth. Landscape uses were assumed to increase at the same rate as the county population. **Table 20** shows the estimated amount of fresh water use from the proposed new landscape and recreational uses. The projection methodology is discussed in Appendix F.

Landscaping makes up 42 percent of this category with the remaining 58 percent distributed among the golf course acreage. These percentages remain the same for 1995 and 2020.

AGRICULTURAL DEMAND

1995 Water Use Estimates

Determination of the actual water use for 1995 was limited because only a small amount of agricultural water use is reported. It therefore became necessary to develop a

Table 20. Landscape and Recreation Self-Supplied Demand (MGY).

Region	1995	2020	% Change
Orange Area	3,106	4,071	11
Osceola Area	497	2,147	276
Polk Area	278	436	44
Highlands Area	1,268	1,918	52
Okeechobee Area	100	122	22
Glades Area	0	0	0
Total Kissimmee Basin	5,249	8,694	66

Growth projections from: SFWMD Districtwide Water Supply Assessment, 1998.

process to determine the number and location of irrigated acres in order to estimate crop watering demands. A process was also needed to correlate the demand estimates with the District's consumptive use permitting (CUP) database which provided the water source information. The tool chosen to perform this data intensive analysis was a Geographical Information System (GIS).

In 1998, the District completed a contract to create a GIS land use/land cover electronic coverage for the entire district. In this coverage, crop types, acreage and location, among other items, are identified along with property ownership. Fifteen representative crop types were identified through this process. The collected crop information was then associated with the well location, property ownership and water source information available in the District CUP database. This provided a means to correlate irrigated crops with withdrawal locations and water sources.

Based upon the large number of water use permits and the reliability of well location information provided in the database, the search of the water use database was limited to permits allocating more than 100,000 GPD (Individual Permits). This set of permittees represent the majority of the total agricultural water use and are collectively identified as "permitted uses."

In addition to the identification of the larger permitted users, agricultural operations using water at a rate less than 100,000 GPD (General Permits) and those water uses not found in the water use database (including below threshold or non-permitted uses) were also identified. These identified uses were grouped together to create an "other" water use category. Because no location of source information is associated with these uses, the location of the water withdrawals was assigned to the center of each field (polygon) and the source was assigned the most commonly used aquifer/water body in the area. The total agricultural water use demands include both the permitted and "other" water use categories. The crop acres identified in this process became the baseline for future agricultural acreage increases. The distribution of the 1995 acreage totals among the counties is shown in **Figure 11**.

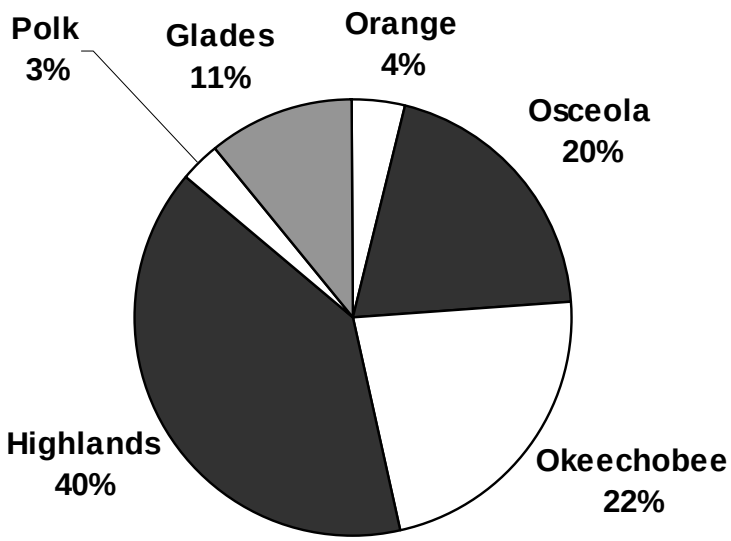

Figure 11. Distribution of Agricultural Acreage per County for 1995.

Identified agricultural operations less than five acres were removed from consideration because the confidence limit of the land use/land cover is 5 acres. These small areas are thought to be due primarily to spatial differences between the permit boundaries and the land use/land cover caused by differences in methods used to capture the information.

The crop acreage and crop type information identified through the land use/land cover for permitted agricultural operations was compared with the information sent in by the permit applicant and quantified in the CUP database. In most cases, the crop type and acreage identified through the land use/land cover information compared well to the crop type and acreage information contained in the CUP database. Differences were addressed by using the land use/land cover information unless other information was available. For those identified agricultural operations that did not have a corresponding SFWMD permit, the crop type and acreage identified through the land use/land cover was used.

Irrigation efficiencies were also obtained from the CUP database and standards set forth in the BOR. If an irrigation system was identified in the CUP database, it was used in the calculations. If no system was identified, the system efficiency was based upon crop type. If the agricultural operation was identified as citrus, an irrigation efficiency of 0.85 was used. If the crop was identified as sod, row crop, field crop, or golf course an irrigation efficiency of 0.75 was given. If the crop was identified as sugarcane, an irrigation efficiency of 0.5 was assigned. It was presumed for this exercise that pasture was not irrigated from a ground water source in less than 1-in-10 drought conditions.

Agricultural acreage not identified as located in a permit were assigned a water source and irrigation system type based on surrounding permitted agricultural operation water use practices. The exception to this was sugarcane which was assigned a surface water source. Primary water sources vary throughout the KB Planning Area.

Upon identifying the acreage and type of agricultural activity, a water use estimate was generated. Water use was calculated based upon estimated acreage for each crop type identified using a modified Blaney-Criddle method. The Blaney-Criddle method of determining supplemental irrigation requirement requires information on rainfall, soil conditions and irrigation efficiency to calculate water demand.

Agricultural water demand was estimated for 1995 to be approximately 308 MGD. Citrus has by far the largest 1995 agricultural acreage (61%) and is followed by row crops (11%). The combined water demand for cattle watering and aquaculture account for less than 1 percent of total agricultural demand. These percentages are predicated on the assumption that pasture is seldom irrigated.

2020 Water Use Projections

The KB Planning Area continues to experience growth in its agricultural industry, especially in citrus production. Projecting when and where this growth will occur involves reviewing the historical crop production and factoring in the past climatic and economic conditions that influenced its growth. The relationship between these factors was estimated using a statistical analysis that is described in Appendix F. This method and analysis was also performed for the Districtwide Water Supply Assessment (DWSA) that was completed in July 1998. The baseline numbers specified in Appendix F differ from those used in that plan. This is because these numbers were adjusted for a revised 1995 baseline number of acres determined from aerial photography. The growth trends identified by the DWSA and explained in Appendix F were used to estimate new water use in the basin beyond the 1995 baseline acreage. **Table 21** shows the projected change in agricultural operations within the KB Planning Area for 2020.

Increases and decreases in projected acreage were distributed evenly with existing CUP permit boundaries where room permitted. In the case of citrus, the number of projected acres exceeded the amount that could be placed within the existing permit bounders. In order to place the additional citrus acreage, the District contracted with the University of Florida's IFAS office to identify land feasibility for new citrus production. The university assisted the District in identifying parcels of land whose ownership and location were most favorable for new citrus production. This information was incorporated into the GIS system, where it was combined with land use/land cover and soils information to identify the most suitable location. The citrus acreage that was not previously distributed among the existing land owners was then evenly distributed among the identified parcels receiving the highest ranking. According to the IFAS study, the most probable locations for future citrus operations were areas that had a flatwood soils (determined through the National Resources Conservation Service), had a land use of cleared pasture (identified by the land use/land cover), and was owned by a party who had

Table 21. Projected Change in Agricultural Operations within the Kissimmee Basin Planning Area for 2020.

County	Projected Change (acres)	Source
Glades	+3,909 Citrus	DWSA
Glades	+1,144 Field crops	DWSA
Glades	+11,050 Sugarcane	Agriculture community
Highlands	+21,713 Citrus	DWSA
Highlands	+9,000 Fruits/vegetables	DWSA
Highlands	+950 Sugarcane	Agriculture community
Highlands	+100 Potatoes	Agriculture community
Okeechobee	+6,874 Citrus	DWSA
Okeechobee	+1,027 Nursery	DWSA
Okeechobee	+250 Potatoes	Agriculture community
Orange	-2,935 Citrus	DWSA
Osceola	-399 Citrus (NSC)	DWSA
Polk	-438 Citrus (NSC)	DWSA

NSC = no significant change.

existing agricultural operations, some or all of which were citrus, of more than 160 acres. This process did not identify specific parcels for future growth, but rather provided a reasonable means for identifying the most likely distribution of citrus growth for the year 2020.

The placement of fruits and vegetables within Highlands County was based on local agriculture knowledge, all of which fell outside permitted areas. The placement of additional nursery operations within Okeechobee County was also based on local agriculture knowledge. The placement of Glades County sugarcane was based on local agriculture knowledge.

A summary of the projected number of acres for each crop type is presented in **Table 22**.

Projected sugarcane acres were placed on lands identified by these growers. **Figure 12** presents a graphical comparison of agricultural demand by crop type for 1995 and 2020.

Agricultural water demand was estimated for 2020 to be approximately 476.7 MGD or 173,995 MGY. Citrus has by far the largest 2020 agricultural acreage (61%) and is followed by row crops, including sugarcane, increasing at a rate of 18 percent. The majority of the agricultural growth is projected for Highlands and Glades counties while decreases are projected for Orange, Osceola, and Polk counties. The fastest growth for any

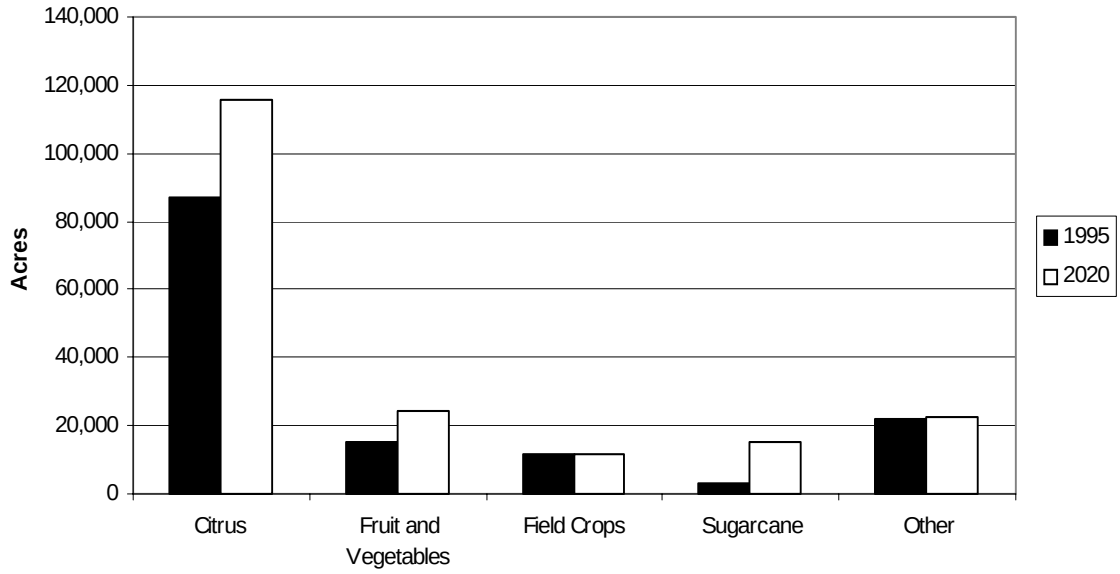

Figure 12. Comparison of 1995 to 2020 Crop Acres.

Table 22. Existing and Projected Irrigated Acreage by Crop Type.

Category	Total Irrigated Acreage 1995	Total Irrigated Acreage 2020	% Change
Citrus	87,190	115,520	32.5
Tropical Fruit and Nuts	1,131	1,131	0
Vegetables and Melons	14,092	23,092	64
Field Crops	11,474	11,474	0
Sod	3,970	4,270	8
Greenhouse and Nursery	2,664	3,755	41
Sugarcane	3,308	15,308	363
Dairy, Cattle, and Aquaculture[a]	13,838	13,838	0
Other	4,262	4,262	0
Total Planning Area	141,929	192,650	36

a. acres related to production, not irrigation.

one crop type is sugarcane at 363 percent, all of which is expected to withdrawal from surface water resources in Highlands and Glades counties.